The WGBH Music-Image Workshop

Report of Activities: June 1972 through January 1974
by Ron Hays

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For the vision and work of Nam June and Shuya and Fred Barzyk's support on their behalf, there remain endless images...

Ron Hays

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Intention and Followthrough

From original proposal of September 7, 1971:

"Our objective is nothing less than to bring to music-image making the beginnings of a common grammar and framework. Without it, music-images will never attain the marks of a mature artistic discipline -- to be both demanding and satisfying at a high order of creative expression...

The first task of the workshop, led by Ron Hays as project coordinator, will be to screen existing music-image materials and consult with various artists, musicians, critics, filmmakers, producers and directors."

About work actually pursued:

I looked at everything I could find that tried to relate music to images: WGBH-TV's videotape coverage of the Boston Symphony Orchestra in concert... Video Variations, the collection of video pieces made by Nam June Paik, Stan VanDerBeek, James Seawright and others, as designed to complement their choice of symphonic performances... pure image pieces from WGBH's diverse TV experiments of the past... films by the animator Norman McClaren... Fantasia... pieces from KQED's National Center for Experiments in Television... tapes by Woody and Steina Vasulka of The Kitchen in New York City...

I met with Nam June Paik, video artist and co-inventor of the Paik-Abe Videosynthesizer... Professor Gyorgy Kepes, artist, aesthetician, and director of M.I.T.'s Center for Advanced Visual Studies... David Loxton of WNET's Television Lab... Richard Felciano, Boston's Composer in Residence... Fred Barzyk, David Atwood, Rick Hauser, Mary Feldhaus-Weber, Roy Brubaker and Michael Rice, all of WGBH... Brice Howard of KQED's National Center...

"Next we shall assemble simple references to the formal ingredients of music-images, including image archetypes and the discrete variables for changing and combining images."

I started working with four image types:
Wave-form
Sweep modulation
Sine and square oscillation
Feedback

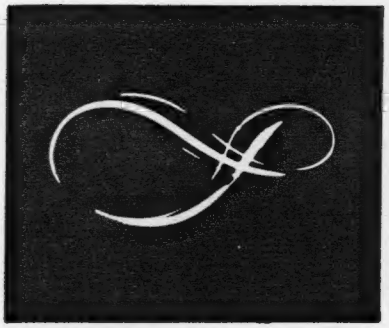
All four types could be generated on WGBH's Paik-Abe Videosynthesizer. That device also offered the instrument and setting for exploratory work in quiet and privacy. So I decided to use it as my basic experimental tool. In time I learned to use the Videosynthesizer in dealing with these further image types as well:
Matte and keyed
De-beamed
Live-action
Computer-generated
Film-generated
Static

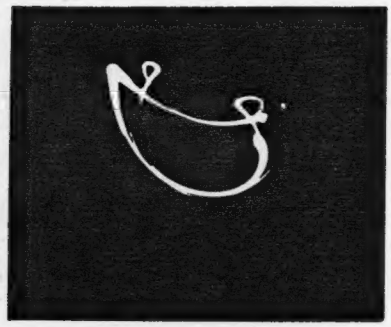
All of these image types were capable of motion. Some could be completely stopped to hold a particular configuration over time, as well as sped up or slowed down in their movement. Most were soft-edged. Their colors could be made -- with some difficulty -- to range from black-and-white to pastels to vividly drenched hues.

It took me a long time to find out how -- by means of knobs, dials, switches, cameras, lenses, and monitors -- to generate and vary each image as I wanted. A practiced physical dexterity became almost as important as knowing which control might change which aspect of the image. Learning how to make the machine respond as I intended was like one's beginning attempts to play a musical instrument. I spent months at it.

The next page shows three examples of the basic image types that formed the visual repertory of the Videosynthesizer experiments.

(1) Wave-Form Images





Controlled by Audio Generator 1 & 2
(refer to diagram)

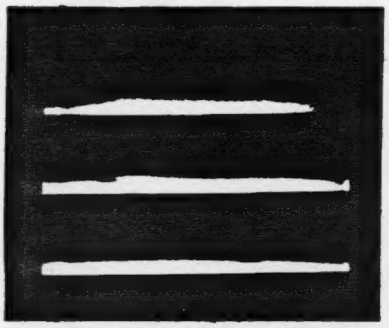
(2) Sweep Modulation Images

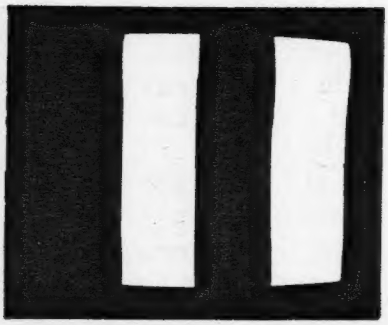
Pattern A

Pattern B

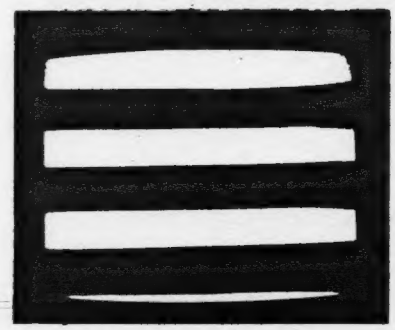
Controlled by Audio Generator 4, 5 & 6
and AC Generator 3M

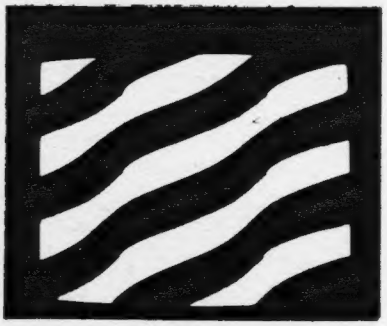
(3) Sine-Square Oscillation Images





Sine Wave Patterns





Square Wave Pattern
Controlled by Audio Generators 5 & 6

"We shall go on to describe the distinctly
different ways of varying such images:
Duration
Development in time
Superimposition
Color
Light intensity
Definition
Representational content
Abstract content
Juxtaposition
Switching effects
Editing, etc."

I soon learned that feedback images could be varied in real time in many ways, particularly in combined movement with wave-form, sweep modulation, and sine/square oscillation images, as well as with other feedback images. Such changes in the shape of the image could be further enriched by changes in the contrast ratio, brightness, color hue and saturation -- all being familiar aspects of control even in conventional television equipment.

To those variations found possible within the Videosynthesizer's capacity, I would add image ingredients from external sources -- from television slide and film chains, and from video tape machines and switchers. To do that, I could choose from several available techniques -- matting or keying, superimposition, and direct input. The video switcher was capable of modulated or unmodulated wipes. Either display monitors or the Videosynthesizer's own cameras could feed in live-action images. Any computer-generated or film-generated imagery already recorded on videotape or film could be drawn on via the television camera chains and tape machines in WGBH's Master Control.

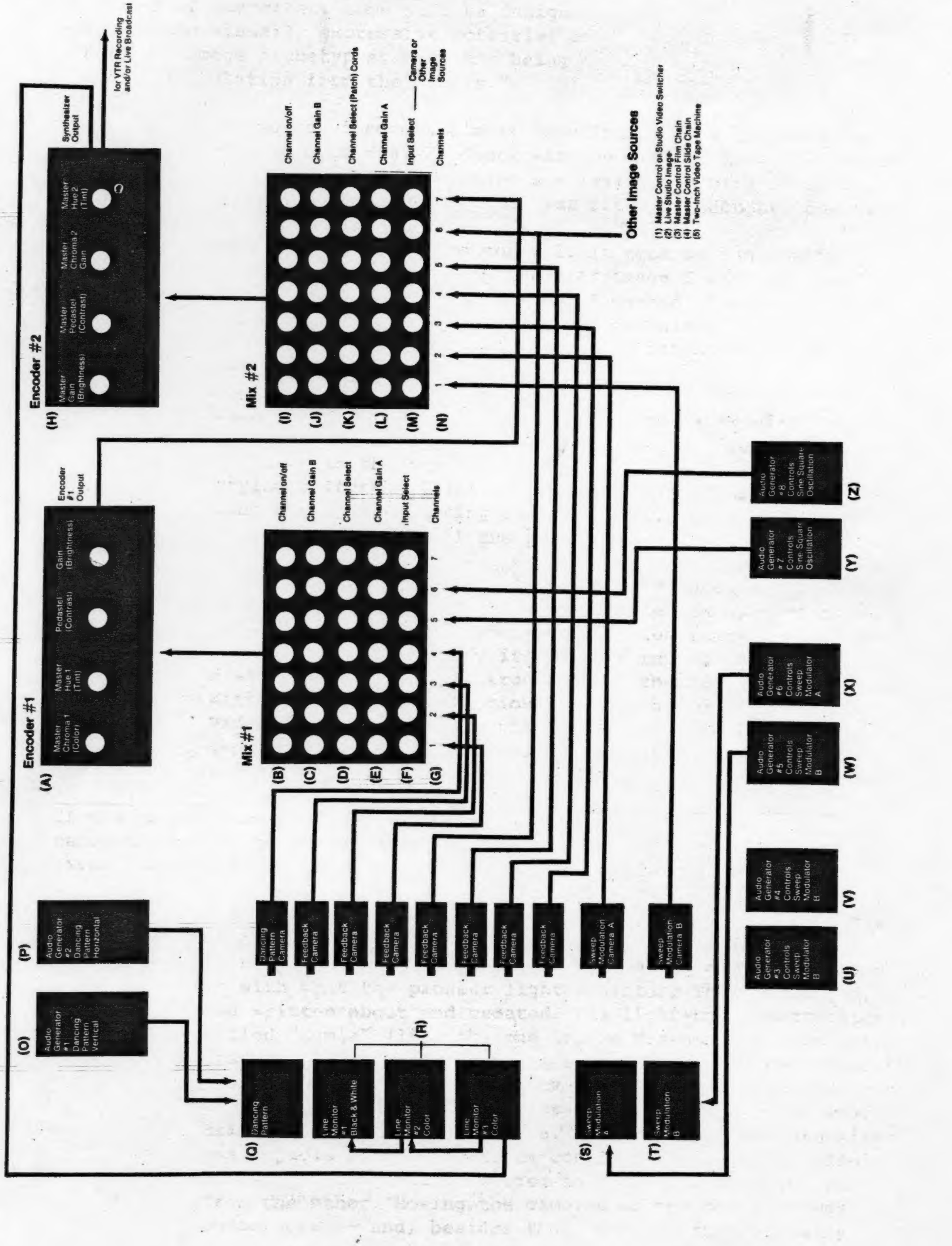
"From this inquiry, we shall write both a
proposition and a guide. The proposition will
state what music-images should be conceived to be."

The most dynamic image type was feedback. It was the form through which every other image type appeared capable of its richest possible expressiveness. So, almost without realizing it at the time, I had a working proposition about music-images that naturally framed my experiments from the start and throughout the course of the workshop. Given the tools at my command, and my own sensibilities to music as they had developed then, I proceeded on the working proposition that there existed a dynamic relation between feedback and other image types, as well as between feedback and music, both being time-based forms of art; and so feedback would be, for my purpose, at the core of music-image conception.

"The guide will indicate the formal ingredients of music-images, as well as how to generate and vary them."

The "guide", too, became a working matter, not a fixed set of rules or instructions. At its best, it took the form of demonstrations for students, artists and engineers -- some in the Videosynthesizer studio, some at universities and museum galleries (by means of sample video material shown from helical-scan recordings), and one "how-to presentation" broadcast in Boston as part of a live festival program about new uses of video. The bank of tapes built up over the course of the workshop are used regularly as a reference guide. So, too, are some of the articles and explanatory notes that have been published from time to time in WGBH's magazine and other periodicals.

The next page shows the diagram used to explain the generation of four types of images with the Videosynthesizer and the approach to image-crafting which I have developed with the Videosynthesizer. (Please refer to page 85.)


Encoder #2
(H)
Master Gain (Brightness)
Master Pedastel (Contrast)
Master Chroma 2 Gain
Master Hue 2 (Tint)
Synthesizer Output
for VTR Recording and/or Live Broadcast
Mix #2
(I) Channel on/off
(J) Channel Gain B
(K) Channel Select (Patch) Cords
(L) Channel Gain A
(M) Input Select
(N) Channels
Camera or Other Image Sources
Other Image Sources
(1) Master Control or Studio Video Switcher
(2) Live Studio Image
(3) Master Control Film Chain
(4) Master Control Slide Chain
(5) Two-Inch Video Tape Machine
Encoder #1
(A)
Master Chroma 1 (Color)
Master Hue 1 (Tint)
Pedastel (Contrast)
Gain (Brightness)
Encoder #1 Output
Mix #1
(B) Channel on/off
(C) Channel Gain B
(D) Channel Select
(E) Channel Gain A
(F) Input Select
(G) Channels
(P) Audio Generator #2 Dancing Pattern Horizontal
(O) Audio Generator #1 Dancing Pattern Vertical
Dancing Pattern Camera
Feedback Camera
Sweep Modulation Camera A
Sweep Modulation Camera B
(Q) Dancing Pattern
Line Monitor #1 Black & White
(R)
Line Monitor #2 Color
Line Monitor #3 Color
(S) Sweep Modulation A
(T) Sweep Modulation B
(Z) Audio Generator #8 Controls Sine Square Oscillation
(Y) Audio Generator #7 Controls Sine Square Oscillation
(X) Audio Generator #6 Controls Sweep Modulator A
(W) Audio Generator #5 Controls Sweep Modulator B
(V) Audio Generator #4 Controls Sweep Modulator B
(U) Audio Generator #3 Controls Sweep Modulator B

"With that in hand, we shall devise and conduct a number of exercises. Some will be designed to explore the visually expressive potential of different image archetypes, each one being tested in isolation from the others."

As noted, feedback almost immediately came to dominate the experiments. Feedback was the kind of image configuration produced by pointing a television camera at a television monitor. The result was often, I thought, beautiful.

But it wasn't easy to control. It took me ten months to learn how to create a particular image I wanted, then to determine its movement also as I wanted. Randomly created images and those which repeated themselves soon grew tedious. Only the image reflecting an intended design could sustain interest.

Each particular image movement required a trial-and-error, real-time design process. The result came from my interaction with the capabilities of the Videosynthesizer -- trying different light levels, adjusting lenses, activating circuits, altering camera angles, changing external image inputs, and all the rest.

I underscore the nature of the process because one's first reaction to seeing the Videosynthesizer in operation is, typically, to presume that it generates images spontaneously, that it can play itself once turned on -- much like a wind-up toy. That is true only on the most mundane level. Without someone's intentional design and operation, the Videosynthesizer is an artistic neuter. Handled intelligently, however, it becomes an extraordinary tool for the visual artist.

"If the results are richly varied, we shall have demonstrated the broad artistic promise of a given image form."

Early in my work with feedback, I began to see it not just as an image type, but as a medium of light. I liked to think of it as a new kind of electronic light. I compared it with what the pioneer light sculptor, Thomas Wilfred, had written about and created. His light-box constructions, called "Lumia" (like the one in the Museum of Modern Art), produced image movements that seemed to change continuously and indefinitely. The feedback I was working with at first either recycled continually or simply hung there in what Brice Howard calls videospace. I knew the Videosynthesizer was capable of many feedback configurations, but I didn't know how they could be varied in real time, one to and from the other. Moving the cameras or the monitors was cumbersome -- and, besides that, too limiting visually.

The answer lay in three other image types: wave-form, sweep modulation, and sine-square. These image types, marked by complex movement patterns, could be varied and mixed as an integral aspect of a feedback image. It became possible to create image developments over relatively long spans purely by manipulating the electronic controls -- dials, knobs, and switches -- as they would affect a particular camera and monitor setup.

I started envisioning what I wanted as imagings -- another Brice Howard term. Not the single image of an instant, but what comes before and after it, was the important thing. The total sequence and flow of change gave the imagery an organic identity. That in turn created the promise of video image-making as an art that exists in time -- just as music does. This form of image most appropriately conjoins with music because, like music -- but unlike painting or other static visual arts— one of its defining parameters is duration.

"The more important exercises will explore the inter-related impressions created when images and music are brought together in different combinations."

Almost immediately, upon introducing music to the experiments, I concluded that no single image type, nor even any single combination, could be developed enough to complement the whole of a piece of music. Permutations of the different types were needed to achieve contrasts and complexities, as might be found in the music itself. Yet it was not uncommon that one type or another would rightly dominate a given work of music. In each of the following examples, the dominant image type was always developed and varied in association with feedback.

"Here our object is to learn whether some images seem to strike more appropriate relations than others with certain music styles."

I used square waves (alternating thin and wide lines) for music by the Modern Jazz Quartet. In this instance, the effect of feedback appeared sparingly (as with a cymbal roll).

Sine waves and feedback produced moving floral shapes that worked well for Seals and Crofts' "East of Ginger Trees". Occasionally, the image was meant to accentuate a sound (the pluck of guitar strings). Otherwise, it took a more independent but still complementary track (color-saturated broad bands accompanied the more deliberate pace of the closing section).

Barber's "Adagio for Strings" called for the balletic abstractions produced by sweep modulation mixed with feedback. So, also, did my video version of Ravel's "Daphnis and Chloe" (months earlier, I did a music-image film with the same music).

The first movement of Bartok's "Music for Strings, Percussion and Celeste" led to a visual merge of sweep modulation, wave-form, and feedback. I wanted to create a nocturnal landscape where something surrealistic could occur at any time. Sweep modulation set the image field for one sequence, and reverse-scan feedback for another. I used up to five different feedback cameras at once. It was wave-form that generated the frenetic abstractions appearing periodically. Those abstractions and the sounds of the celeste occurred at moments as single impressions, inseparable in the instant of sensing them. They gave an illusion of depth to the total image, the wave-form being the figure to which the sweep modulation was the ground. These elements became recurrent visual motives, but not in a slavish one-to-one relation to the motives of the music. It was never my intention to make imagery the equal or the stand-in for the music. Such would have defeated the very notion of making it the complement.

It was the Bartok that gave me the first conscious experience of operating the Videosynthesizer as a creative performance in real time. I had developed the visual motives, contrasts and directions through many rehearsals with the music. But as I proceeded, each rehearsal was itself a distinctively different performance -- and thus the result, a different work, since even for the final recording, I still made new decisions on image placement, rate of movement, and color as I responded ever more closely to the music. It seemed to me that I was playing the Videosynthesizer the way a musician would play improvisatory jazz.

"Garden of Love's Sleep" by Olivier Messiaen was perfect for reverse-scan feedback (the camera's signal is split in half, making Rorschach-like images). I combined two kinds of feedback by laying a camera on its side and gently raising the light intensity. The result was floral mandala that grew repeatedly from a point at the center of the screen, marked by a rate that was uncannily appropriate to sections of the music. At certain moments I faded in wave-form lines that further impelled the reverse-scan feedback, transfiguring it into an apparent liquid dripping from the moving lines of wave-form. Sine waves played a part, too.

For a portion of Dvorak's "Concerto for Cello and Orchestra", I found a wave-form that was so beautifully composed and so graceful in its orbits and rates of movement that I felt it could be the single visual motive. Since its

natural movement pattern was cyclical, I varied it by feedback, reverse-scan feedback and sine waves. Control of color was critical. This piece, like the Bartok above, lent itself to real-time Videosynthesizer performance. The result was a dance of thin rounded lines and soft flowing liquids made of light and color.

"Each step of the way, we shall involve musicians and composers as much as visual artists. Their ideas and selections, in keeping with our commitment to make the images serve the music, will shape the basic musical structure of our exercises. For the most part, we shall be testing different image archetypes in relation to existing music of many styles."

Time and production circumstance allowed me to involve musicians and composers in only modest ways, for the most part.

I did rely on a music consultant in building a tape-recorded music library, the object being to obtain a wide representation of periods and styles with which to conduct the image experiments.

But finally I worked with the music selections that sounded most promising -- for imaging purposes -- to me. Music-image making on the Videosynthesizer, at least as I practice it, is a personal art. When working with music that already exists, the visual artist is necessarily left with all the remaining choices. I had to recognize that early in the workshop.

"But to some extent, we shall also commission the composition and performance of new music, especially as we identify composers who are interested in writing music intended not only to be heard, but also to evoke or accompany images."

I experimented with new music, improvised and performed by Michael Tilson Thomas, principal guest conductor of the Boston Symphony Orchestra. He acquainted himself with the image types and some of their variations. He selected the piano and the clavichord as instruments on which he might simultaneously compose and play in an interacting relation with live image generation. He was at the keyboards while I was at the Videosynthesizer, but in different studios, so we each saw what we were producing in concert by means of interconnected output monitors. At one point, David Atwood mixed, by keying and matting, the camera's view of Thomas' head and hands (otherwise he was blacked out) with image movements from the Videosynthesizer.

It was easier to involve visual artists in the workshop, though they were often only tangentially interested in the music-image potential. In several experiments, music was merely incidental or non-existent. But the visual ideas thus developed became part of the available image vocabulary.

WGBH staff director David Atwood is an accomplished visual artist himself, and his contributions to the workshop, both technical and artistic, were so integral to all the activities that this history would not have unfolded without him.

Wilson Chao and Mark Allen of the Orson Welles School in Cambridge made important technical advances in the Videosynthesizer's image capacity, as did other guest artists and engineers who worked with it on an ad hoc basis.

Gyorgy Kepes conducted experiments synthesizing images of objects -- marbles, string, plexiglass -- and of fluid material -- water and flame.

Mary Ann Amacher, also of the M.I.T. Center for Advanced Visual Studies, recorded and mixed the sounds created by a number of people strumming (and otherwise playing) an electronically-amplified wire-and-cable sculptural construction 20 feet long and 15 feet wide (it had been designed and built by M.I.T. architectural students), while David Atwood at a video switcher mixed the camera images of the sculpture with my own simultaneously generated synthesizer imagery.

Once, at the Eastman School of Music, jazz musicians were invited to improvise to a silent image-movement piece I had already recorded, thus reversing the more usual sequence of music-image creation.

Olivia Tappan of WGBH's staff was among those who produced their own music-image pieces -- in her case, Bach's "Air on the G String".

"Finally, of course, as the staff and participating artists become more sensitive to the image possibilities and to the key music-image relations, we shall produce a number of complete music-image recordings."

Production of whole music-image pieces emerged as the normal experimental activity of the workshop much earlier than anticipated, as shown by the examples noted above.

"Some will be good, some not, but each will have the starting benefit of everything learned and sensed from the various exercises. This will be the stage where the entire array of image archetypes and their infinite combinations will be available for whatever mix seems right for the music."

Many of the pieces and experiments were recorded solely by half-inch helical-scan videotape equipment. These have been labelled and archived. They were often used, and still are, for instructional sessions, gallery showings, museum exhibitions, and other closed-circuit applications.

The first over-the-air broadcast of a major workshop production was in April 1973, when WGBH-TV aired the videotape of the Videosynthesizer image composition-and-performance I did the previous January simultaneously with the recording of the television camera coverage of the Boston Symphony Orchestra in a performance of Ravel's "Daphnis and Chloe". The broadcast program was a visual mix of synthesizer imagery with camera shots of the orchestra and conductor, made the more interesting by the simultaneous broadcast of the music in quadraphonic sound over two synchronized FM-stereo radio stations.

"At the conclusion to the first year, we shall assemble the most telling results in a videotaped program with brief explanations."

Demonstration tapes of various kinds were assembled for specific occasions. They served the purpose of communicating the lessons learned to others doing similar work or simply interested in new video art forms.

"We shall also release for broadcast those complete music-image recordings which we believe succeed in their own terms and will help to build an appreciation for music-images."

The most extensive broadcast offering to-date was the nightly MUSIC-IMAGE series, aired late in the evening by WGBH-TV in Boston in May 1973: different pieces every night for twelve nights. All of those pieces, necessarily, were committed to two-inch broadcast-standard, quadraplex videotape recordings. The series included pieces by artists at other experimental centers (Ed Emshwiller, Stephen Beck). It was the first time I know of that abstract video imagery was broadcast as a regularly-scheduled television program series. Viewer reactions by phone and letter were numerous and greatly encouraging.

"All such program materials will be offered to the Public Broadcasting Service (PBS) for broadcast by its 210 member stations across the country."

We couldn't release the May 1973 MUSIC-IMAGE series nationally because of music clearance obstacles. But in November 1973, three new pieces under the MUSIC-IMAGE title were broadcast nationwide on PBS, one each immediately following an episode of a three-part serial on MASTERPIECE THEATRE.

"The success of the workshop -- and its future -- will stand or fall by these trial examples of music-images as a coherent art."

Such trial examples must be meeting with some success, given the new music-image commissions being made as a direct outgrowth of the broadcasts. The workshop has concluded its formal grant period.

But new work continues. In cooperation with WGBH, CBS' CAMERA THREE will incorporate video imagery I have created to complement the performance of "Ancient Voices of Children" by the contemporary American composer, George Crumb (first broadcast: Sunday, December 23, 1973).

In a joint production of WGBH and Amberson Video, Inc., I shall produce the visualization for a music-image program based on portions of Wagner's "Tristan and Isolde" conducted by Leonard Bernstein.

Under the projected WGBH NEW TELEVISION WORKSHOP, I hope to produce a radically expanded original work, mixing synthesizer imagery with other visual material produced on film and videotape, including dance movement, iconographic resources and objects. As before, the vision will be abstractionist, but this time, perhaps, more overtly metaphoric.

The Paik-Abe VideoSynthesizer (see diagram and photographs) can be described as an optical color video image generator, capable of taking the inputs of multiple black-and-white cameras and audio generators and converting them into an infinite number of patterns and image configurations. The synthesizer has no direct hookup to music or sound waves. It is manually operated. It was designed and built by Nam June Paik and Shuya Abe in 1969-70.

Its basic image-archetypes are:

1 Sweep Modulation Pattern A
2 Sweep Modulation Pattern B
3 Paik Dancing Pattern or Wave Form
4 Sine-Square Oscillation
5 Feedback-images result when the synthesizer cameras not being used to pick up the above listed image-archetypes or external "live" images are pointed at the display monitors.

There are two color encoders (converters) which control the overall color saturation, color, contrast and brightness on display television monitors.

Encoder One

The first encoder processes images from five SONY black-and-white cameras and two audio generators (producing sine-square wave images) assigned to channels on a mixing panel #1 below the encoder. Each of those channels has two Gain or brightness knobs which can be varied separately from the old encoder controls or simultaneously with it. All channel inputs are governed, however, by the encoder #1 color saturation, color, contrast and brightness master controls.

Additional Cameras

The synthesizer is presently equipped with ten SONY black-and-white television cameras. Encoder #1's Mix #1 is designed to accept seven additional camera inputs. This means that with seven other cameras on Mix #2, the synthesizer can operate with a total of twenty-one cameras.

Mix #1 camera input select (letter F) has three separate positions. This control requires that only one camera or image-input source can be functioning on each channel at a time. In other words, switching to another camera can be done if more than one camera is on a channel, but two or three cameras can never function at the same time on one channel. Because channels 5 and 6 on Mix #1 are usually assigned to audio generators 7 and 8, each channel can accept only two more cameras.

Encoder Two

Encoder #2 is a second image processor/converter with the same image controls as Encoder #1. It also has seven camera inputs and seven other inputs which can accept images from "other image sources" listed on the diagram. Each channel has two gain or brightness knobs. As with Encoder #1, Encoder #2 also governs all the channel image inputs on Mix #2.

Encoder #2 can function alone or in conjunction with the Encoder #1 or vice versa. When the Encoder #1 is hooked up to Encoder #2, a channel input is used to send its already processed image, i.e., brightness, saturation, color and contrast image, through Encoder #2 before it reaches the synthesizer television monitor for final display.

The Four Image-Archetypes

The first four image-archetypes listed above are picked up by small SONY black-and-white television cameras. The images from these cameras are black-and-white when they go into the encoders and are colorized when they come out.

Sweep Modulation has two small television monitors A and B which display two characteristically different patterns -- fan-like and being controlled by AC generator #3 and Audio Generators #4, #5 and #6.

Sine-Square Oscillation images are controlled by two audio generators, #7 and #8, assigned channels five and six on Mix #1.

The Paik "Dancing Pattern" or wave form is controlled by audio generator #1 and #2 and its images may be picked up by one or more synthesizer cameras.

Feedback Images come from the cameras labelled "feedback" cameras, each of which can be beamed at any external object desired (within the focal range of the camera) besides the display monitors.

The four image archetypes are diagrammed on page 3.

Images from Other Sources

Input from a studio, master control or portable video switcher is usually made through one of seven channels on Encoder #2. With the capability of this input, slides, film, video effects such as wipes, modulated wipes, etc., can be used with the above listed and described synthesizer image-archetypes. These images will always be subject to the colorizing control of the encoders and, therefore, images from these sources will be finally displayed in their original colors or characteristics.

A video switcher can also process or convert the final display output of the synthesizer. This means that the synthesizer imagery can be matted, keyed, supered with another source-image, wiped, modulated wiped and/or colorized in a variety of ways.

An Approach for Controlling the Variables and Limiting the Choices

To gain control over a chosen feedback archetype's duration, development in time, light intensity, definition, abstract content and its final occurrence in time with the music, I developed the following methodology to be used in conjunction with the image-archetype's creation and appearance during an image-movement performance on the Paik-Abe Videosynthesizer.

Encoder Two: Fixed Master Settings / Letter H

Fixed Settings (as marked on the panel) of Master Chroma (Color saturation), Master Gain (Brightness), Master Pedestal (Contrast) on Encoder #2, letter A, provide a constant brightness or light level which will appear on the main display monitors. This brightness or light level is the light "base" upon which all feedback images are created. The settings as marked also keep the brightness levels of the final image output at acceptable recording and/or broadcast levels. That level is between 100 and 105 as indicated on the synthesizer's wave-form display scope residing above Mix #1. After much experiment, I have found these settings provide the light level "base" which is the most versatile for creating a wide variety of distinctive and effective feedback and combined archetype-image results. These controls are rarely touched in a performance.

Encoder Two: Mix Two Gain Settings / Letters J and L

All Gain B knobs on Mix #2 are set full or turned as far to the right as possible. Gain A knobs are used as the primary controls for fading in, changing, shaping, merging the images relative to feedback cameras or other image-input sources on assigned Mix #2 channels.

If variation of one image on one channel is desired, the effect of Gain B is to brighten or intensify the image. With experiment, a more desired image may be discovered at a setting of Gain B which is further to the left of the full right position. In order to diminish control variables, it is best to fix that setting so that it does not require change during a performance. Again, control will reside with Gain B.

Encoder Two: Patch Plugs on Mix Two / Letter D

Each channel of Mix #2 has "patch plugs" which complete the circuit flow to the encoder from image-input sources. These patch plugs can be single or double-patched. If two plugs are used, the image will brighten or intensify. The choice of the desired image should be made by testing whether the brighter image is desired over the less bright image resulting from a single patch. A single or double patch should be decided upon to avoid pulling or plugging during a performance.

Encoder One: Master Controls / Letter A

Encoder One master controls of Chroma, Gain, Pedestal and Hue provide the primary light level variations presiding over the images produced through the cameras and sine-square oscillation audio generators assigned to each channel input on Mix #1. Each channel input can be varied with Gain A or B (letters C and E) with or without changing the old encoder controls. The Encoder One master controls can be set at levels which offer the desired image. Variations can be made during performance without concern for broadcast or recording brightness levels since Encoder Two Master Control settings will limit the final output from Encoder One. Encoder One's input is usually connected to channel seven of Mix #2.

Encoder One: Mix One Gain Controls / Letters C and E

Contrary to the rule of control for Gain B on the Encoder Two/Mix #2, Gain A on Mix #1 is the primary control for fading up, changing, shaping, merging the images relative to feedback cameras and sine-square oscillation (usually channels 5 and 6) assigned to specific channels. Gain A affects the brightness or intensity of an image-input and can be varied during a performance along with Gain B to achieve a desired image. Again, it is best to fix that setting for Gain A in order to diminish control variables during performance.

Image Quality: Encoder One and Encoder Two

Encoder One offers an image quality which is much more "soft" than the more "metallic" or brighter images on Encoder Two. Combining images from Encoder #1 and Encoder #2 will produce a variation of image which can only be seen and one which I will not attempt to describe because of lack of constants.

The Building of Camera Setups for Feedback Images

The most important step in the "growing" of feedback imagery is the building of camera setups -- that is, the placing of cameras in front of the monitors and then making camera adjustments. The basic variables related to cameras are diagramatically explained on page 6. A photograph of an exemplary camera setup appears on page 93. Placing the cameras and then making adjustments with the camera controls is a process which requires patience and care. Variations are based on displayed image results. By making adjustments on those controls described above and adjusting only those controls which are not "fixed", the process of growing feedback images carefully begins.

The crafting of feedback images is an interdependent relationship between the variable master controls on Encoder One and fixed master controls on Encoder Two. Depending on

the channel which is assigned to each camera, adjustments can be experimented with on Gain B or A, Mix #1 or Gain B or A, Mix #2. If you are working on Mix #1, adjustments on master controls of Encoder One can be experimented with at the same time. By doing so, the image-range of an individual camera can be discovered.

Different Cameras and Zoom Lenses

Each synthesizer camera has a personality of its own. For instance, the camera labeled reverse-scan feedback produces a feedback configuration distinct to its altered electronics. Regular feedback cameras with no internal adjustments also produce varying images according to its maintenance or minute electronic variables.

It is always best to work with zoom lenses since they will offer the widest range of image possibilities from which to choose.

Key Encoder Master Controls / Letters A and H

The key Encoder Master Controls, whether #1 or #2, are Master Chroma and Master Pedestal. A low Master Pedestal setting (that is, to the left of a far right setting) will produce less intense colors when adjusted in relation to a lower Chroma setting. Master Gain is usually used to "define" and "refine" the image. Effect of these controls can only be learned by working at it. Master Hue control will affect the color of the final display image.

Intermixing with Wave-Form/Sine-Square Oscillation and Sweep Modulation Archetypes

Channels can now be assigned to each of these archetypes except for sine-square oscillation which usually remains relative to channels 5 and 6 of Mix #2. By merging the feedback image from an assigned channel with these individual archetypes, variations of the feedback image are discovered. The effect is one of gaining control over the direction of motion of the feedback light and/or varying its content, light intensity, duration, etc. For instance, any of the above archetypes can be used to "move" the feedback configuration or suspend it on the face of the display monitor. The variety of image possibilities cannot be calculated nor described. Once again, the crafting of feedback images with other Paik-Abe archetypes is interdependent with master controls on Encoder One and fixed master controls on Encoder Two. Depending on the channel which is assigned to each camera, adjustments can be experimented with on Gain B or A, Mix #1 or Gain B or A, Mix #2. If you are working on Mix #1, adjustments on master controls of Encoder One can be experimented with at the same time.

Each camera should be added, one at a time, its image potential explored and discovered before moving into the

final intermix stage with another camera or cameras. By doing so, cameras can be "added" one at a time for a systematic discovery process of image potential.

Intermixing with Other Feedback Cameras

The same procedure as described above should be followed.

Line Monitors / Letter R

Display monitors 1, 2 and 3 produce different feedback configurations. I have found that line monitor black-and-white is far different in its feedback image possibilities from monitors 2 or 3. Line Monitor 2 (Sony Trinitron) produces the most clean and variable feedback images. The position of the monitors and their chroma, hue, contrast, brightness must never be changed during an image-growing process since all camera positions, encoder and mix panel controls are critically interdependent in an image-configuration's make-up.

Color

Describing the color control of the Paik-Abe Videosynthesizer is difficult. Since each channel input on Mix #1 or Mix #2 is governed by its encoder, color control rests with the encoder. Color results occur much as the mixing of primary colors using paint or ink. Since color is nominal to each channel, final color potential can only be discovered by trial and error during the image-growing processes described above.

It is important to remember that different colors will also produce different feedback images. For instance, a color base of green will produce a more explosive feedback image than a color base of red. At the same time, the base will be varied every time a new channel input is faded up from another channel.

Even though color constants do not exist, control and desired colors and images can be arrived at during the image-growing process.

Creating an Image-Movement Composition

As the image potential is learned for each camera and then the intermix-merged results are discovered, the potential for image selection relative to music begins. During the image-growing process familiarity with the music, even playing certain sections of the music, will often lead to a predetermined image selection (or vice versa) or the discovery of a desired image.

Since the process of music-familiarity/image discovery and growth is so interdependent, it is difficult to explain exactly "how" an image movement for performance is created. One place to begin is with the discovered control givens

of an image configuration's make-up. Those can be learned if the process described above has been followed. Because you are moving toward the performance of an organically flowing image-movement with the music, possible image-merge-changes should be learned or experimented with as you move through the image-growing process.

As a theoretical example: Image Configuration One is based on Encoder #1, Master Chroma and Channel Gain B settings relative to feedback camera on channel 2, mixed with sine/oscillation from channel 5. In order to move to Image Configuration Two based on Encoder #2 and Mix #2 Gain A controls, settings must be changed (turned down), sine waves faded out on channel 5, Mix #1, while a simultaneous "fade-up" of feedback camera on Mix #2, channel 3 is executed. Can it be physically executed and will the transition or merging of image one into image two occur effectively and in relationship to the music? If so, can it occur at the time based on its desired placement in the structural flow of music and/or with other sounds, etc? If so, notation of that image-bridge can be made and you can now move on to find what imagings surround it on "either side". Often an image-configuration's merge will form the "image base" of an entire image-movement, even though you want it to occur at a moment half-way through the music.

Blind Rehearsal and Performance

Rehearsal without looking at the knobs producing the images is necessary. There are no knob settings and therefore the display monitor is the only gauge of what the knob setting will create. Blind performance means that best control of image-movements can only be maintained by looking at the display monitor. You must learn how and where to reach for the proper knob and how fast and how far to turn it by watching what it does. Turning a Gain knob or other controls too fast or too slow can destroy the innate beauty of an image because of Videotime -- the rate at which feedback and archetype images move and also the rate at which they can effectively be changed and/or merged.

The Use of Videotime

"Videotime" indicates the rate at which image configurations can be moved during the creation of images on the Paik-Abe Videosynthesizer. Changing the settings of the individual chroma, gain, pedestal and hue dials determines the configuration's change over time, as well as within other variables. Moving the control dials too quickly or too slowly destroys the configuration's effectiveness or beauty.

Every image configuration has its own indigenous videotime, the time during which it is most beautiful or most effective. Learning to recognize that videotime, as well as

being able to control that videotime is essential to effective image-generation.

Why Merge and Not Take

Since feedback images are based on light levels, instant light takes with on-off switches at letters B and I usually result in ineffective and confused images. The nature of the controls on the synthesizer requires a flowing image result. Noise and light flashes also occur which are disruptive to the liquid and graceful movements of the feedback-light configurations. This limitation explains why fast moving music and/or structurally complex music is not easily performed with the Paik-Abe Videosynthesizer. It is also the key to understanding why a feedback and Paik-Abe image-archetype image-movement performance to music usually appears as a slow-moving organic merge. The only archetypes capable of moving rapidly are sine-square oscillation images and wave-form images. Addition of new archetypes which move rapidly has begun, originating from "other image sources" (refer to diagram).

It is the experimenting with the addition of image archetypes listed in the proposal (refer to page 3) not relative to the Paik-Abe image bank and originating from the "other image sources" which offer an idea of the vast image potential now established with the Paik-Abe. Therefore, its use as a creative took is endless. Thank you, Nam June Paik, Shuya Abe and David Atwood.